

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: **Jamison**

Serial No.: **10/761,991**

Filed: **January 21, 2004**

For: **Method for Determining a Close
Approximate Benefit of Reducing
Memory Footprint of a Java
Application**

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Group Art Unit: **2193**

Examiner: **Vu, Tuan A.**

Attorney Docket No.: **RSW920030277US1**

DRAFT CLAIMS FOR ENABLING EXAMINER AMENDMENT

DRAFT CLAIMS FOR ENABLING EXAMINER AMENDMENT**Amendments to the Claims:**

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A computer-implemented method of improving performance in a Java computer application program executable by a Java virtual machine (JVM), comprising the steps of:
 - obtaining information associated with garbage collection; and
 - deducing changes in performance that will result from modifying the Java computer application program;
 wherein a cost of garbage collection to program performance of a modified version of the Java computer application program is estimated by the computer-implemented method using a duration of an average garbage collection event and a frequency of occurrence of particular garbage collection events[[],] ;
 - wherein the duration depends on an amount of garbage that must be cleaned up[[],] ; an algorithm used to do collecting or copying[[],] ; a heap compaction[[],] ; a cost of reconciling object references that are moved[[],] ; and a number of Java-based finalizers that must be executed[[],and] ;
 - wherein the frequency depends on a rate of object creation[[],] ; heap fragmentation[[],] ; size of the heap[[],] ; and a garbage collection policy;
 - wherein the Java computer application program is changed by reducing memory from a footprint of the Java computer application program, wherein given an amount of memory to be reduced from the footprint (m), a total duration for a run (d), and how much of the run is spent in garbage collection (g), a number of additional transactions that can be computed during the run is determined according to:

$$y = \text{function } (m, t, g, d, f), \text{ where}$$

t is current computed throughput of the Java computer application program in transactions/second, f is average memory footprint of the Java computer application program during duration d , and y is the number of additional transactions gained [[after]] as a result of reducing the memory footprint of the Java computer application program to $(f - m)$ during the total duration d .
- 2-7. (Cancelled)

DRAFT CLAIMS FOR ENABLING EXAMINER AMENDMENT

8. (Previously Presented) The method of claim 1, wherein the information associated with garbage collection is obtained from a verbosegc.

9. (Cancelled)

10. (Currently Amended) A computer system capable of running a Java application program by a Java virtual machine (JVM), comprising a computer and further comprising:

a garbage heap associated with garbage collection events, wherein garbage collection events have an average duration and frequency; and

instructions for estimating changes in performance resulting from modification of the Java application program using information obtained about the garbage collection events;

wherein a cost of garbage collection to program performance of a modified version of the Java application program is estimated by the computer system using a duration of an average garbage collection event and a frequency of occurrence of particular garbage collection events $[[,]]$;

wherein the duration depends on an amount of garbage that must be cleaned up $[[,]]$; an algorithm used to do collecting or copying $[[,]]$; a heap compaction $[[,]]$; a cost of reconciling object references that are moved $[[,]]$; and a number of Java-based finalizers that must be executed $[[, \text{ and}]]$;

wherein the frequency depends on a rate of object creation $[[,]]$; heap fragmentation $[[,]]$; size of the heap $[[,]]$; and a garbage collection policy;

wherein the Java application program is changed by deducting memory from a footprint of the Java application program, wherein given an amount of memory to be deducted from the footprint (m), a total duration for a run (d), and how much of the run is spent in garbage collection (g), a number of additional transactions that can be computed during the run is determined according to:

$$y = \text{function}(m, t, g, d, f), \text{ where}$$

t is current computed throughput of the Java computer application program in transactions/second,

f is average memory footprint of the Java computer application program during duration d , and

y is the number of additional transactions gained $[[\text{after}]]$ as a result of reducing the memory footprint of the Java computer application program to $(f - m)$ during the total duration d .

11-15. (Cancelled)

DRAFT CLAIMS FOR ENABLING EXAMINER AMENDMENT

16. (Previously Presented) The method of claim 10, wherein the information associated with garbage collection is obtained from a verbosegc.

17. (Currently Amended) A computer program product stored in a computer readable medium for improving performance in a Java computer application program executable by a Java virtual machine (JVM), comprising:

first instructions for obtaining information associated with garbage collection; and

second instructions for deducing changes in performance that will result from modifying the Java computer application program, wherein a cost of garbage collection to program performance of the Java computer application program is estimated by the computer program product using a duration of an average garbage collection event and a frequency of occurrence of particular garbage collection events[[],];

wherein the duration depends on an amount of garbage that must be cleaned up[[],]; an algorithm used to do collecting or copying, a heap compaction[[],]; a cost of reconciling object references that are moved[[],]; and a number of Java-based finalizers that must be executed[[], and]];

wherein the frequency depends on a rate of object creation[[],]; heap fragmentation[[],]; size of the heap[[],]; and a garbage collection policy;

wherein the Java computer program is changed by deducting memory from a footprint of the Java computer application program, wherein given an amount of memory to be deducted from the footprint (m), a total duration for a run (d), and how much of the run is spent in garbage collection (g), a number of additional transactions that can be computed during the run is determined according to:

$y = \text{function}(m, t, g, d, f)$, where

t is current computed throughput of the Java computer application program in transactions/second,

f is average memory footprint of the Java computer application program during duration d , and

y is the number of additional transactions gained [[after]] as a result of reducing the memory footprint of the Java computer application program to $(f - m)$ during the total duration d .

18-22. (Cancelled)

23. (Previously Presented) The method of claim 17, wherein the information associated with garbage collection is obtained from a verbosegc.